



# **Test Stand Measurements Vertical Slice**

**Leon Mualem  
University of Minnesota  
January 30, 2005**



## Status Summary (From Oct. 2004 Talk)

- Several Working APD readout prototype boards
- 1 working board at UMN
- Currently 3 “in the wild”
  - 2 at IU, 1 at Caltech
- APD cooler boxes coming for these boards, O(weeks)
- More APDs on hand
- Waiting on MASDAs for rest of the prototype boards.
- .....
- Waiting on Extrusions –See Heller extrusion saga talk



## Updated Status

- **MASDAs Arrived!**
  - New boards (3) shipped to UMN for testing at end of December
  - APDs for boards tested, will mount/test distribute
- **Extrusions arrived!**
  - 2<sup>nd</sup> week of '05 60x4ft at UMN and elsewhere
  - 3<sup>rd</sup> week of '05 15x48ft at UMN, UT?
- **Preliminary tests with 3x60cm cell in test box**
  - Light output measured with ancient BC-517L and PMT with 0.8 and 1.2mm fiber



# New Extrusions!

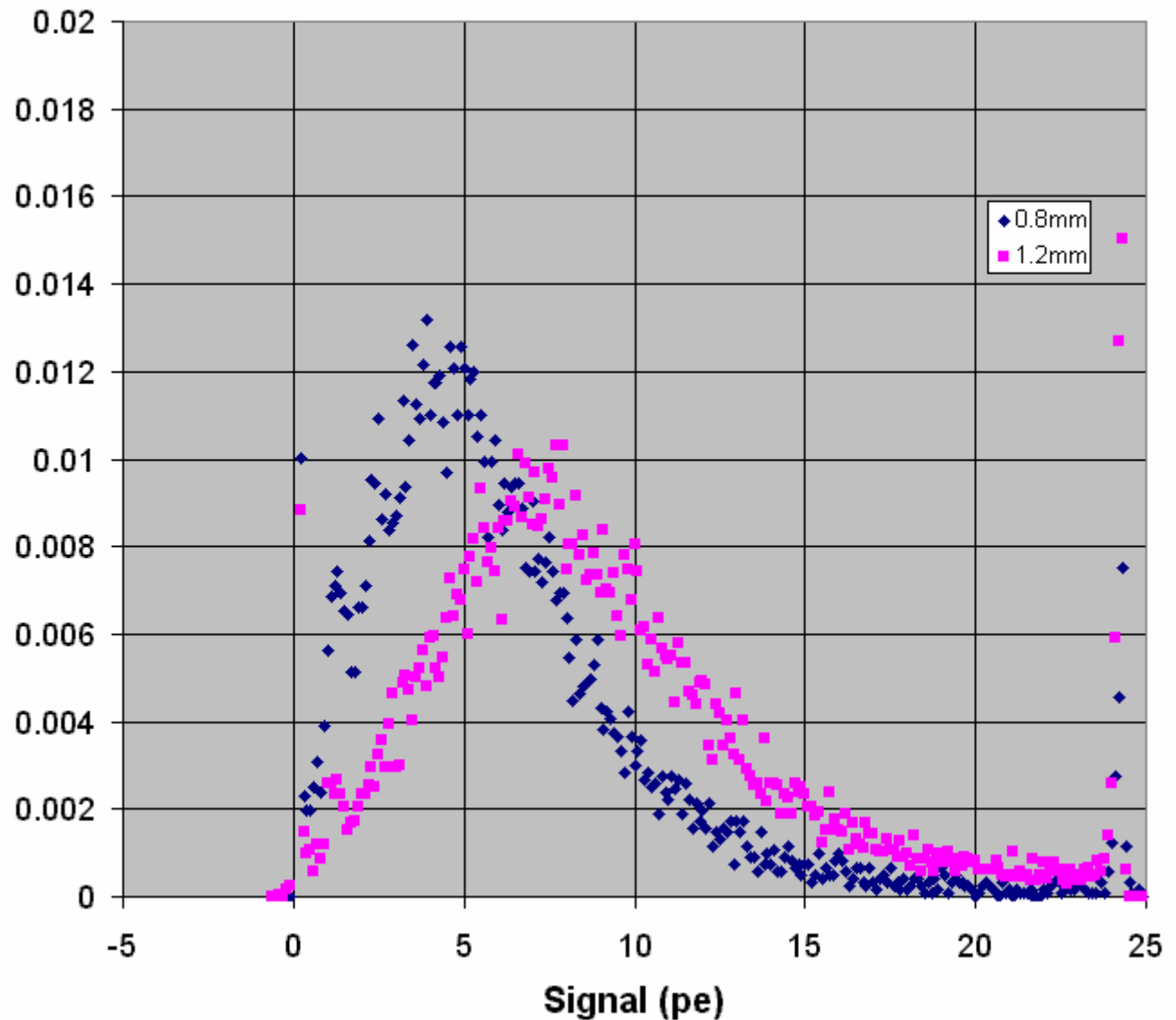




## New Results (UMN)

Mean Signal from  
single 0.8mm fiber  
 $\approx 6_{pe}$

Mean Signal from  
single 1.2mm fiber  
 $\approx 9_{pe}$





## More New Results (CIT)

- Unofficial preliminary results
- Tests with looped 0.8mm fiber
  - PET (Georgia Gulf) = 9.8pe
  - PET (????) = 15.6pe



# Light output measurement and calculation with existing cells

- Measured light at 1m with single 0.8mm fiber and PMT
  - 6 pe
- Correction for path length in cell  $\div 1.2$ 
  - 5 pe
- Expected light output at 1m with looped fiber x2
  - 10 pe
- Expected light output at 1m with APD QE x8
  - 80 pe
- Expected light output at 15.7m from measured atten  $\div 4$ 
  - 20pe



## **Is this hopeless?**

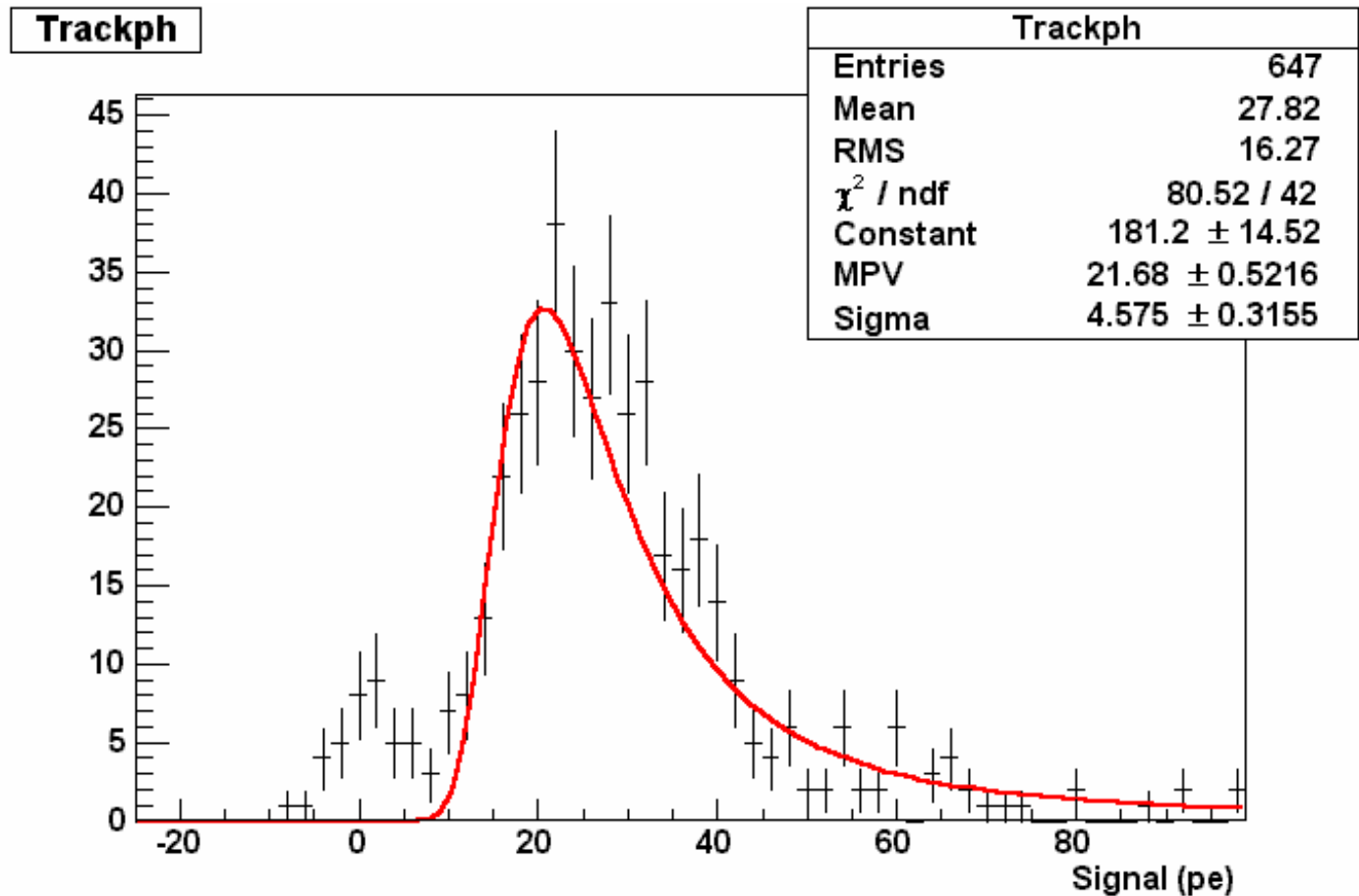
# **NO**

- Existing cells are 2.2cm thick, baseline was 2.54 x1.15
  - 23 pe
- Existing cells are 12-ish%  $\text{TiO}_2$ , baseline 15% x1.??
- Optimize position for light collection (spiders) x1.??
- Increase fiber diameter x1.??
- These are all things we control, not looking to “get lucky”
- 10% here, 10% there, pretty soon you’re talking real gains.



# A real signal

- A real 22pe signal detected with APD readout in our prototype tracker module
- Lose some efficiency at the far end, or increase noise somewhat
- Has been simulated already – a 25pe signal level showed no significant change of FOM





# Conclusions

- **Light output from initial tests is encouraging**
  - **Less than we had hoped, but there are known deficiencies in the current extrusion**
  - **Room for improvement**
- **Need to couple to APDs and test light output**
  - **Need more HV, need water chiller for temp control**
- **Need to test boards and APDs; Deliver to Texas**
- **Need to test full length fibers and extrusions**
- **Test mechanics stringing methods**
  - **May need more fiber/scintillator for modules**
- **Test bubbles?**